Local heat preconditioning to prevent wound breakdown and skin necrosis: A translational study

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Disclosures

Y. Harder is consultant for Hilotherm GmbH

The clinical problem

Ischaemically challenged tissue

Wound breakdown: up to **39%** [1]

Skin flap necrosis: up to **54%** [2]

[1 Zoumaras J et al.: Aesthet Surg J. 2008]

[2 Sotheran WJ et al.: Ann R Coll Surg Engl. 2004]

Surgical delay

[Reinisch JF: Plast Reconstr Surg, 1974]

Surgical delay

[Reinisch JF: Plast Reconstr Surg, 1974]

Invasive and time-consuming

Tissue preconditioning as alternative

Application of supraphysiologic stress to tissue prior to surgery

- Maintenance of microcirculation
- Increase of ischaemic tolerance of the tissue

Tissue preconditioning as alternative

- "True" preconditioning (PC)
  - Ischaemic
  - "Remote" ischemic

[Murry CE et al: Circ Res, 1990]

[Przyklenk K et al: Circulation, 1993]

- Systemic pharmacological PC
  - Monophosphoryl Lipid A
  - Erythropoietin
  - Ghrelin

[Harder Y et al.: Anesth & Analg, 2005]

[Harder Y et al: Surgery, 2009]

[Rezaeian F & Harder Y et al: Am J Physiol, 2012]

- Local physical PC
  - Shock-wave
  - Cooling
  - Heat

[Tobalem M & Harder Y et al: J Surg Res, 2013]

[Yunoki M et al: J Neurosurg, 2002]

[Yamashita N et al: Circulation, 1998;
Harder Y et al: Ann Surg, 2005]

Study aim

Effectiveness of repetitive local heat preconditioning

Incidence of

- Wound break down
- Skin flap necrosis

Methods

1. Skin Sparing Mastectomy and immediate breast reconstruction

- 25 patients:

  Local heat preconditioning

- 25 patients:

  No preconditioning (control)

2. Reduction Mammaplasty (RMP)

- 15 patients:

  Local heat preconditioning of one breast

  No preconditioning of the other breast (control)

Methods

[Hilotherm GmbH, Deutschland]

Methods

PC initiated 18 hours prior to surgery

Perfusion measurements

Skin flap necrosis?
Wound breakdown?

Results. Overall

- No burns were noticed
- Heat-induced hyperaemia completely vanished prior to surgery

Results: Skin Sparing Mastectomy

Skin perfusion

1 hour after mastectomy
un-preconditioned

1 hour after mastectomy
preconditioned

[Farhadi J & Harder Y et al: J Plast Reconstr Aesthet Surg, 2013]

Results: Skin Sparing Mastectomy

Mean *$p < 0.05$ *vs.* control

[Farhadi J & Harder Y et al: J Plast Reconstr Aesthet Surg, 2013]

Results: Skin Sparing Mastectomy

Mean ± SD *$p < 0.05$ *vs.* control

[Farhadi J & Harder Y et al: J Plast Reconstr Aesthet Surg, 2013]

Results: Reduction Mammaplasty

Results: Reduction Mammaplasty

Summary

Local heat preconditioning

- Can be translated into daily clinical surgery
- Increases perfusion in ischaemically challenged tissue
- Significantly decreases skin flap necrosis
- Reduces wound breakdown
- Reduces length of hospital stay
- Does not increase postoperative drainage

Conclusions

Local heat preconditioning in specific breast procedures

- Safe
- Simple
- Efficient
- Applicable briefly prior to surgery
- Cost-effective

Perspectives